

Synopsis V1.0
Single Event Transient Testing of the
Microsemi JANS2N2222A NPN Silicon Switching Transistor

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I. Introduction

This study was undertaken to determine the single event transient susceptibility of the JANS2N2222A NPN Silicon Switching Transistor. The device was monitored for transient interruptions in the output signal induced by exposing it to a heavy ion beam at the Texas A&M University Cyclotron Single Event Effects Test Facility.

II. Devices Tested

The sample size of the testing was two devices. The devices were manufactured by Microsemi and were characterized prior to exposure. The devices tested had a Lot Date Code of 0137MS.

III. Test Facility

Facility: Texas A&M University Cyclotron Single Event Effects Test Facility, 15 MeV/amu tune.

Flux: 1.15×10^5 to 1.4×10^5 particles/cm²/s.

Ion	LET (MeVcm ² /mg)
Kr	28.8
Xe	53.1

IV. Test Methods

The JANS2N2222A was tested with heavy ions. The basic block diagram showing the test configuration is shown in Figure 1 and the JANS2N2222A test circuit is shown in Figure 2. The collector of the JANS2N2222A is tied to a 120 Ohm pull up resistor while the emitter and base are grounded. A dc voltage of 20 volts is applied to the pull up resistor and the voltage across the collector–base junction is monitored via a digital oscilloscope. A voltage reading of 20 volts appear on the digital oscilloscope since the gate of the JANS2N2222A is open. The collector–base junction is monitored in order to see if the heavy ions can cause the gate of the JANS2N2222A to close which will result in a voltage reading of 0 volt. The output voltage threshold for the test circuit was set at 19.75 volts and the monitored voltage of 20 volts never went below the set threshold.

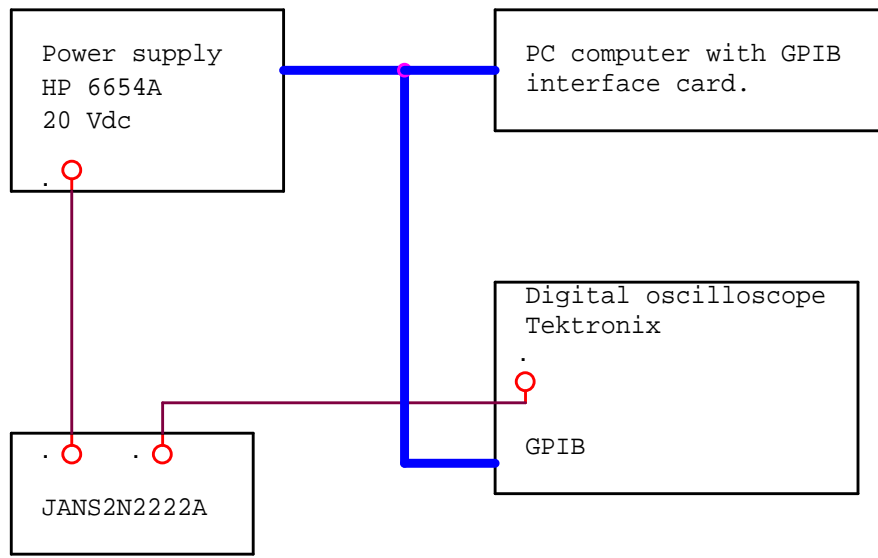


Figure 1. Block diagram for the test configuration for the JANS2N2222A.

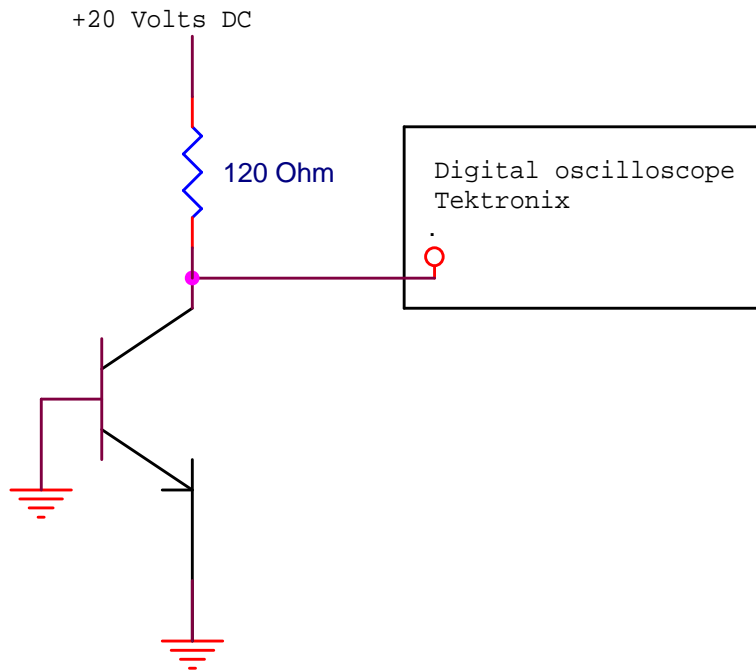


Figure 2. Schematic diagram for the test configuration for the JANS2N2222A.

V. Results

During the testing the JANS2N2222A was irradiated with the Kr beam and then the Xe beam at normal incidence. Testing was done for both parts with the collector tied to a 120 Ohm pull up resistor while the emitter and base are grounded. Under all these conditions, no single event

transients were observed. Therefore, the LET threshold for transients on the JANS2N2222A is greater than 53.1 MeV-cm²/mg.

VI. Recommendations

In general, devices are categorized based on heavy ion test data into one of the four following categories:

Category 1 – Recommended for usage in all NASA/GSFC spaceflight applications.

Category 2 – Recommended for usage in NASA/GSFC spaceflight applications, but may require mitigation techniques.

Category 3 – Recommended for usage in some NASA/GSFC spaceflight applications, but requires extensive mitigation techniques or hard failure recovery mode.

Category 4 – Not recommended for usage in any NASA/GSFC spaceflight applications.

The JANS2N2222A NPN Silicon Switching Transistors are Category 1 devices.